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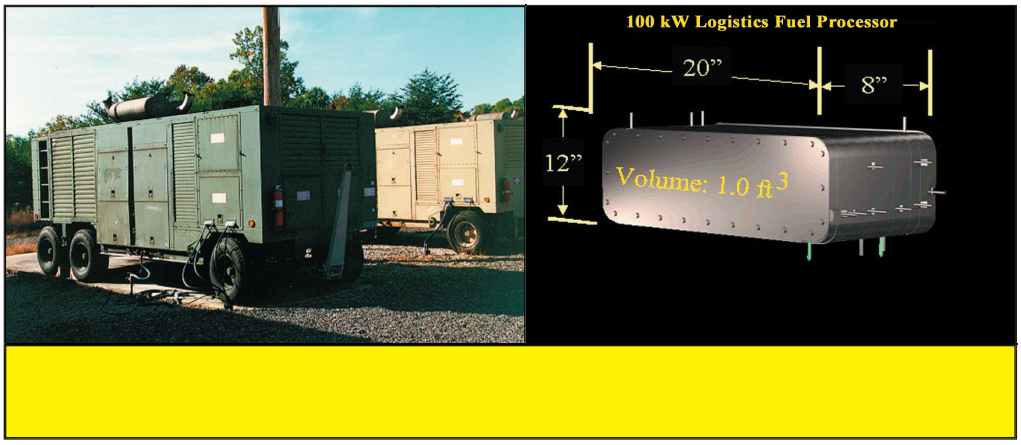
Success Story

MATERIALS RESEARCHERS DEVELOP FUEL PROCESSOR TECHNOLOGY THAT WILL ENABLE IMPROVED POWER GENERATION AT REMOTE LOCATIONS



The rapid evolution of fuel cell technology as a replacement for conventional electric power generators provides the potential for future power systems that use hydrogen as their primary fuel. The fuel processor will provide the user with efficient, easily operable, highly reliable, on-demand production of hydrogen at bare base locations. The compact and modular power generator, which consists of the fuel processor and fuel cell, will result in a 16% reduction in deployment airlift requirements and will offer lower emissions, infrared signature and noise levels, and a 50% reduction in power generation sustainment costs.

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Accomplishment

Materials and Manufacturing Directorate researchers are developing a deployable logistics fuel processor, which will permit the use of a reliable and easily operated fuel cell power system as an alternative to current mobile electric power (MEP) units. By replacing current MEP units, fuel cell technology, which uses hydrogen as the primary energy source, allows light and quick deployment of this important infrastructure element.

Background

Today's mission requires a "light and lean" Air Force who must be prepared to rapidly deploy and indefinitely sustain forces to protect vital US interests. Operations abroad require mobile, air deployable infrastructure elements to stage and support land and air operations in remote locations.

MEP is one of seven essential deployment infrastructure elements. Overseas Air Force bases use MEP-12 generators, large 750 kilowatt generators driven by diesel engines, to provide electrical power. To support a contingent of 1,100 airmen, four 1,353 cubic foot MEP-12 generators, which individually weigh 25,734 pounds, must be deployed, with one generator as a standby unit. This requires four transport aircraft and 4,000 gallons of fuel per day, which puts a severe burden on an already stressed air fleet.

Researchers from the directorate's Air Expeditionary Forces Technology Division faced several challenges in developing fuel processor technology. Due to the potential pitfalls of sulfur content and coking while reforming heavy hydrocarbon fuels, such as JP-8 and diesel, effectively using battlefield logistic fuels as the primary energy source for fuel cells was difficult. Directorate researchers developed a fuel processor capable of removing all of the sulfur in fuel before it is reformed, producing ultra-clean hydrogen using hydrogen membrane technology. This reforming process also removes impurities such as carbon monoxide, carbon dioxide, and hydrogen sulfide.

In addition, the fuel processor developed in the lab uses an efficient radiant burner and a compact microchannel evaporator to produce the high pressure and high-temperature steam needed for the fuel reforming process. In order to recover water from fuel cell exhaust, which is 100% humid air, engineers also developed a compact condenser unit. The recovered water can be recycled and used for future reforming processes.

Materials and Manufacturing
Emerging Technologies

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (02-ML-02)